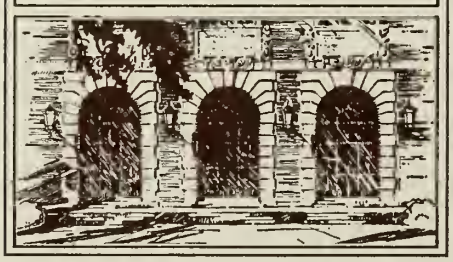
LIBRARY OF THE
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

510.84
Il6r
no.171-187
cop.2



Digitized by the Internet Archive
in 2013

http://archive.org/details/reportonspecialn178ehrm

Report No. 178

A REPORT ON A SPECIAL NSF SUMMER 1964 COMPUTER PROGRAM FOR UNDERGRADUATES

510.84
I16r
no.178
cop. 3

by

J. R. Ehrman, N. T. Hamilton and T. A. Murrell

UNIVERSITY
JAN 07 19
LIBRARY

May 28, 1965

DEPARTMENT OF COMPUTER SCIENCE · UNIVERSITY OF ILLINOIS · URBANA, ILLINOIS

Report No. 178

A REPORT ON A SPECIAL NSF SUMMER 1964 COMPUTER PROGRAM FOR UNDERGRADUATES*

by

J. R. Ehrman, N. T. Hamilton and T. A. Murrell

May 28, 1965

Department of Computer Science
University of Illinois
Urbana, Illinois

*This work was supported in part by the National Science Foundation under grant GE4220.

Introduction

This report is a description of a special summer program on the design, construction, and use of stored-program digital computers conducted by the Digital Computer Laboratory during the eight week period from June 15, 1964, to August 7, 1964. The participants in the program were chosen from undergraduates from colleges and universities in the United States and Canada who had finished their sophomore or junior years, but who had not completed their senior years. The program was arranged by Professor J. R. Ehrman, and instruction was given by Professors J. R. Ehrman, N. T. Hamilton, and T. A. Murrell of the Digital Computer Laboratory.

The object of the program was to provide a thorough introduction to digital computers, and to encourage an interest in computers and computing in the hope that some of the students might consider graduate study in the field.

The reader is referred to DCL Reports 112 and 129 for descriptions of the program in previous years.

Selection of Participants

Two means were employed for advertising the program: notices were placed in the journals Physics Today and The Communications of the Association for Computing Machinery, and a form letter, posters, and a brochure describing the Digital Computer Laboratory were sent to the chairmen of various departments at a large number of schools.

Attachment I to this report contains the list of departments and schools contacted, and copies of the form letter and poster.

Many requests for application forms and information were answered, and a large number of applications was received. In addition to the application form (Attachment II to this report), three letters of reference and a transcript of grades were requested. Sixty-four applications were received, of which twenty-seven were complete by the closing date, February 15, 1964.

From these twenty-seven applications, thirteen names were chosen by a committee consisting of Professors J. R. Ehrman, N. T. Hamilton, and G. Metze, and were ranked into two groups of ten accepted applicants and three alternates. The selection criteria were the grades shown in the transcript, the letters of recommendation, and the statement written by the applicant on the application form; previous experience with computers was not a factor in selecting the successful applicants.

The successful applicants were notified by letter on February 26, and were asked to indicate their acceptance by March 31, 1964. Eight of the successful candidates accepted, and a ninth, an undergraduate at the University of Illinois, requested and was given a part-time position in the Digital Computer Laboratory. The participants in the program and their schools is given in Attachment III.

Program

The program consisted in part of regular seminars. One series led by Ehrman which met daily for seven weeks, was devoted to programming topics; a second, led by Hamilton, which met daily for seven weeks, discussed the structure and use of ILLIAC II and devoted considerable time to numerical analysis and related mathematics (see Attachment V); a third series, led by Murrell, which met daily for seven weeks, considered logical design of computers, transistor theory, and transistor circuits (see Attachment VI).

In addition, several one-hour seminars were given by members of the Laboratory, including:

H. C. Brearley	Magnetic Drum Memory on ILLIAC II
S. R. Ray	Magnetic Core Memories
J. T. Bagwell, Jr.	The MAD Compiler
R. Bayer	Features of ALGØL
J. N. Lockhart	The Information Processing Language IPL-V

The seminar on programming covered a variety of topics, including:

1) the organization, internal structure, and internal arithmetic of the IBM 7094;
2) Machine Language programming, including macro assembly techniques and the use of various input-output devices;
3) the structure of the operating system on the University of Illinois IBM 7094;
4) an introduction to the compiler language FØRTRAN;
5) a discussion of basic methods for the solution of systems of linear equations and for zeros of functions.

Some of the problems given to the students for solution on the computer are included in Attachment IV.

The students undertook a variety of special projects in mathematics and programming. Mitchell worked for a short time on a computer-logic simulation program, which would perform all the logical steps of the computer hardware. Later in the summer he completed quite an extensive program to compute the number of lattice points in a k-dimensional hypersphere, and has written up the results to be submitted for publication. He was assisted by Czuchlewski in the preparation of several programs to print out running values of the statistics being accumulated during the computations.

Another ambitious project was undertaken by Farrell and Czuchlewski, who (in connection with a project to examine the distribution of partial quotients in the continued fraction expansion of a class of transcendental numbers) began the programming of a complete package of extremely high-precision floating-point arithmetic routines. Because of the scope of the project and the relatively short amount of time available, the basic arithmetic routines were completed, but the conversion and others were not.

Rolland undertook two projects: the first involved the deviation of points and weights to be used for efficient and accurate evaluation of principal value integrals; the second was a program written in SNOBOL (a character-string manipulation language) which analytically differentiates FØRTRAN-type algebraic expressions.

Schwartz computed an extensive table of primes, and assisted the systems programming staff in the correction of some errors in the I/O conversion routines.

Shen became quite interested in several aspects of systems programming, and lent assistance to E. Akemann of the 7094 Programming Staff in the debugging of double-precision and complex arithmetic statements in FØRTRAN, and in the testing of a complicated routine for compressing and decompressing symbolic decks.

Conclusions and Recommendations

As in past years, the program appears to have been quite successful in introducing a carefully selected group of undergraduates to computers and computing. The general format of the program--a small number of participants meeting several staff members in regular seminars--seems quite well suited to discussion of the subject matter covered by the program.

As may be gathered from the letters of evaluation from the participants (which appear as Attachment VII), there were several areas in which improvements could be made. One of the most vexing of the many difficulties facing any visiting student is the mass of administrative red tape to be overcome: the details of housing, fees, registration, admissions, stipends, etc., were given considerable attention prior to the arrival of the students, but a number of bothersome matters still remained. On the whole, however, it appears that the participants had far fewer frustrations than participants in earlier years.

The decision to conduct the seminars on the programming of the 7094 at a regular rate rather than by having the students receive and study the appropriate materials in advance was made on the grounds that uniformity of presentation would give better over-all results. It appears in retrospect that the eagerness and initiative of the participants in the program offsets this factor to a large degree. Similarly, since the 7094 is representative of a large class of powerful high-speed computers, it was felt that going into considerable detail in the discussion of a particular machine would in the long run be of greater benefit than rather more briefly describing a variety of machines.

One of the major benefits of the program is the possibility of working on a large-scale project. A number of students undertook such projects, which were completed in most part by the end of the eight-week period. In particular, the work done by Mitchell on the lattice-point problem has been published as a Department of Computer Science Report No. 175, and has been submitted for publication in a mathematics journal.

In summary, it is felt that the program is a most worthwhile project, and that it has contributed in a material way to the education and prospects of the participants.

ATTACHMENT I

LIST OF SCHOOLS CONTACTED

FORM LETTER

POSTER

ATTACHMENT I

SCHOOLS AND DEPARTMENTS CONTACTED

Colleges and Universities	Address	Departments
University of Arizona	Tucson, Arizona	Math., E.E., Physics
University of Arkansas	Fayetteville, Arkansas	Math., E.E., Physics
University of California	Berkeley, California	Math., E.E., Physics
University of California	Davis, California	Math., Physics
University of California	LaJolla, California	Physics
University of California	Los Angeles, California	Math., Physics
California Institute of Technology	Pasadena, California	Math., Physics
University of California	Santa Barbara, California	Math., Physics
Stanford University	Stanford, California	Math., E.E., Physics
University of Colorado	Boulder, Colorado	Math., E.E., Physics
Yale University	New Haven, Connecticut	E. E., Physics
Georgetown University	Washington, D.C.	Math., Physics
George Washington University	Washington, D.C.	Math., Physics
University of Delaware	Newark, Delaware	Math., E.E., Physics
University of Florida	Gainesville, Florida	Math., E.E., Physics
Florida State University	Tallahassee, Florida	Physics
University of Georgia	Athens, Georgia	Math., Physics
Illinois Institute of Technology	Chicago, Illinois	Math., E.E., Physics
Roosevelt University	Chicago, Illinois	Math., Physics
University of Chicago	Chicago, Illinois	Math., Physics
Millikin University	Decatur, Illinois	Math., Physics
Northwestern University	Evanston, Illinois	Math., Physics
Knox College	Galesburg, Illinois	Math., Physics
Indiana University	Bloomington, Indiana	Math., Physics
De Pauw University	Greencastle, Indiana	Math., Physics
Purdue University	Lafayette, Indiana	Math., E.E., Physics
University of Notre Dame	Notre Dame, Indiana	Math., E.E., Physics
Earlham College	Richmond, Indiana	Math., Physics

SCHOOLS AND DEPARTMENTS CONTACTED (CONT'D)

Colleges and Universities	Address	Departments
Iowa State University	Ames, Iowa	Math., E.E., Physics
Drake University	Des Moines, Iowa	Math., Physics
Grinnell Iowa	Grinnell, Iowa	Math., Physics
State University of Iowa	Iowa City, Iowa	Math., E.E., Physics
Cornell College	Mount Vernon, Iowa	Math., Physics
University of Kansas	Lawrence, Kansas	Math., E.E., Physics
University of Kentucky	Lexington, Kentucky	Math., E.E., Physics
Louisiana State University	Baton Rouge, Louisiana	Math., E. E., Physics
Bates College	Lewiston, Maine	Math., Physics
Bowdoin College	Brunswick, Maine	Math., Physics
University of Maine	Orono, Maine	Math., E.E., Physics
Colby College	Waterville, Maine	Math., Physics
Johns Hopkins University	Baltimore, Maryland	Math., E.E., Physics
University of Maryland	College Park, Maryland	Math., E.E., Physics
Amherst College	Amherst, Massachusetts	Math., Physics
Harvard University	Cambridge, Massachusetts	Math., E.E., Physics
Massachusetts Institute of Technology	Cambridge, Massachusetts	Math., E.E., Physics
Radcliffe College	Cambridge, Massachusetts	Math.
Smith College	Northampton, Mass.	Math., Physics
Brandeis University	Waltham, Massachusetts	Math., Physics
Williams College	Williamstown, Mass.	Physics
Clark University	Worcester, Massachusetts	Math., Physics
Worchester Polytechnic Institute	Worcester, Massachusetts	E.E., Physics
University of Michigan	Ann Arbor, Michigan	Math., E.E., Physics
Wayne State University	Detroit, Michigan	Math., E.E., Physics
Michigan State University	East Lansing, Michigan	Math., E.E., Physics

SCHOOLS AND DEPARTMENTS CONTACTED (CON'D)

Colleges and Universitites	Address	Departments
University of Minnesota	Minneapolis, Minnesota	Math., E.E., Physics
Institute of Technology	Minneapolis, Minnesota	Math.
Carleton College	Northfield, Minnesota	Math., Physics
Washington University	St. Louis, Missouri	Math., Physics
University of Nebraska	Lincoln, Nebraska	Math., E.E., Physics
Dartmouth College	Hanover, New Hampshire	Math., E.E., Physics
Rutgers University	New Brunswick, New Jersey	Math., E.E., Physics
Princeton University	Princeton, New Jersey	Math., E.E., Physics
University of New Mexico	Albuquerque, New Mexico	Math., E.E., Physics
Hamilton College	Clinton, New York	Physics
Queens College	Flushing, New York	Math., Physics
Colgate University	Hamilton, New York	Math., Physics
Cornell University	Ithaca, New York	Math., E.E., Physics
City College	New York, New York	Math., Physics
Columbia University	New York, New York	Math., E.E., Physics
Hunter College	New York, New York	Math., Physics
New York University	New York, New York	Math., E.E., Physics
Washington Square College	New York, New York	Math., Physics
Yale University	New York, New York	Math.
Vassar College	Poughkeepsie, New York	Math., Physics
University of Rochester	Rochester, New York	Math., Physics
University of North Carolina	Chapel Hill, North Carolina	Math., Physics
Duke University	Durham, North Carolina	Math., E.E., Physics
University of Cincinnati	Cincinnati, Ohio	Math., E.E.
Case Institute of Technology	Cleveland, Ohio	Math., E.E., Physics
Ohio State University	Columbus, Ohio	Math., E.E., Physics
Kenyon College	Gambier, Ohio	Math., Physics
Oberlin College	Oberlin, Ohio	Math., Physics

SCHOOLS AND DEPARTMENTS CONTACTED (CONT'D)

Colleges and Universities	Address	Departments
Miami University	Oxford, Ohio	Physics
Antioch College →	Yellow Springs, Ohio	Math., Physics
University of Oklahoma	Norman, Oklahoma	Math., E.E., Physics
University of Oregon	Eugene, Oregon	Math., Physics
Reed College	Portland, Oregon	Math., Physics
Lehigh University	Bethlehem, Pennsylvania	Math., E.E., Physics
Haverford College	Haverford, Pennsylvania	Math., Physics
Bucknell University	Lewisburg, Pennsylvania	E.E.
University of Pennsylvania	Philadelphia, Pennsylvania	Math., E.E., Physics
Carnegie Institute of Technology	Pittsburgh, Pennsylvania	Math., E.E., Physics
University of Pittsburgh	Pittsburgh, Pennsylvania	Math., E.E., Physics
Swarthmore College	Swarthmore, Pennsylvania	Math., E.E., Physics
Brown University	Providence, Rhode Island	Math., E.E., Physics
Vanderbilt University	Nashville, Tennessee	Math., E.E., Physics
University of Texas	Austin, Texas	Math., E.E., Physics
University of Utah	Salt Lake City, Utah	E.E., Physics
Washington State University	Pullman, Washington	Math., E.E., Physics
University of Washington	Seattle, Washington	Math., E.E., Physics
Whitman College	Walla Walla, Washington	Math., Physics
University of Wisconsin	Madison, Wisconsin	Math., E.E., Physics
Marquette University	Milwaukee, Wisconsin	Math., E.E., Physics
University of Montreal	Montreal, Quebec	Math.
McGill University	Montreal, Quebec	Math.
University of Toronto	Toronto, Ontario	Math., E.E.
University of Manitoba	Winnipeg, Manitoba	Math

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER LABORATORY
URBANA, ILLINOIS

I am writing to ask you to nominate undergraduate students who would be interested in being considered for the program described in the enclosed announcement. We plan to take at most ten students and therefore suggest that you recommend that only very promising students apply. Previous experience with digital computers is not required. We shall give preference to those students who are considering going on to graduate school; we do not expect any applicant to promise to go on to graduate study at the University of Illinois.

Our purpose in offering this program for the fourth consecutive year is to stimulate interest in the design and use of computers among future graduate students. We feel that this purpose will be met if a group of promising young people who are likely to go on to do graduate work are brought together for eight weeks and subjected to a training and working program.

The enclosed brochure describing the Digital Comuter Laboratory may be of interest to you and some of the students you may consider for nomination.

Thank you for your trouble.

Sincerely yours,

A. H. Taub

A. H. Taub
Head of the Laboratory

AHT:arf

Enclosures: Application forms
Brochures
Poster

UNIVERSITY OF ILLINOIS · DIGITAL COMPUTER LABORATORY

URBANA, ILLINOIS

DIGITAL COMPUTING

for Promising Undergraduates

Beginning June 16, 1964, the Digital Computer Laboratory of the University of Illinois will conduct an eight-week full-time undergraduate training and working program, concerned with the use and construction of computers, for a limited number of advanced undergraduates.

Students in residence at any college or university in the United States or Canada who will be juniors or seniors in the fall of 1964 and who are interested in learning about and working with stored-program digital computers are invited to apply for admission.

Successful applicants will receive a stipend of $400.00 and travel expenses to and from Urbana, Illinois.

No academic credit will be given to students engaged in this program.

Application forms may be obtained from your college or university, or by writing to Professor J. R. Ehrman, Digital Computer Laboratory, University of Illinois, Urbana, Illinois 61803.

The closing date for receiving applications is February 15, 1964.

Appointments will be announced by March 2, 1964.

ATTACHMENT II

APPLICATION FORM

UNIVERSITY OF ILLINOIS · URBANA, ILLINOIS · OFFICE OF ADMISSIONS AND RECORDS

UNDERGRADUATE APPLICATION FOR ADMISSION

A. GENERAL INSTRUCTIONS

Please read and follow carefully all of the instructions in this application form.

1. All applicants for admission must complete the third and fourth pages of this folder.
2. You should familiarize yourself with the curricula offered by the various colleges listed on the reverse side of this sheet before you answer question 18 on page 3 of this folder.
3. Applications for fall admission, with complete credentials, must be received at least two weeks prior to the first day of the registration period.
4. APPLICATIONS AND CREDENTIALS SHOULD BE SENT TO:

OFFICE OF ADMISSIONS AND RECORDS, 100A ADMINISTRATION BUILDING, UNIVERSITY OF ILLINOIS, URBANA, ILLINOIS 61803

B. A FRESHMAN WITH NO COLLEGE CREDIT

1. **If you have received your high school diploma:**
   You should fill in the attached application and hand it to your high school principal with a request that it be mailed directly to this office together with an official transcript of your record. Applications for a summer or fall term should be submitted on or about March 1 preceding the term, and for a spring term on or about October 1.
2. **If you have not graduated but are a high school senior:**
   You may apply when you have completed *seven* semesters of high school work. It should be noted that only those non-residents of Illinois who rank in the upper fifty percent can be considered for admission. You should proceed as indicated in B.1 above. In addition, ask your principal to send with the transcript a supplementary statement showing
   (a) The specific courses in which you are enrolled in your final semester
   (b) The date of your probable graduation
   (c) Your rank in your graduating class based on seven semesters of work.
3. **Each student applying as a beginning freshman must furnish scores on the test battery administered by the American College Testing Program (ACT). Although an applicant may submit the Scholastic Aptitude Test (SAT) scores of the College Entrance Examination Board with the understanding that the testing part of his admission will be based upon these scores, he will still be required to submit ACT scores as early as possible following the receipt of a permit to enter and no later than one month after registration.**

C. A TRANSFER STUDENT WITH COLLEGE WORK COMPLETED ELSEWHERE

1. **If you are not presently enrolled in college you should:**
   (a) Fill in and return to this office the attached application.
   (b) Request your high school principal to send an official transcript to this office.
   (c) Request the registrar of each collegiate institution attended to send an official transcript of your record directly to this office.
2. **If you are presently enrolled in college you should:**
   (a) Follow steps (a) and (b) in C.1 above.
   (b) Request the registrar of each collegiate institution attended to send an official transcript of your record directly to this office. The transcript from the institution in which you are currently enrolled should include the courses with the number of credit hours for each course in which you are enrolled.
3. **All applications for a summer or fall term should be submitted on or about March 1 preceding the term, and for a spring term on or about October 1.**

D. HOUSING. For information, write to, or call at, the office of:

THE HOUSING DIVISION, 420 STUDENT SERVICES BUILDING, CHAMPAIGN, ILLINOIS 61822

See Reverse Side of This Sheet for Colleges and Curricula

15M—11-63—81875

UNDERGRADUATE CURRICULA AT URBANA

You should choose from the main headings below the college in which you intend to enroll and then the curriculum within that college which you believe most nearly meets your present aims. You should answer question 18 on the application blank accordingly.

COLLEGE OF AGRICULTURE. CURRICULA:

- Agricultural Industries
- Agricultural Science[1]
- Agricultural Science[1] — Agricultural Engineering (5-Year Program)
- Core Curriculum[2]
- Dairy Technology
- Floriculture and Ornamental Horticulture
- Food Technology
- Forest Production
- Home Economics
- Home Economics Education
- Horticultural Food Crops
- Restaurant Management
- Vocational Agriculture
- Wood Technology and Utilization

[1] Requires high school rank in upper 50% or 3.5 average for transfer students.

[2] Common program of two years of basic work followed by major.

Transfer students with 45 or more semester hours who plan to follow the Core Curriculum in Agriculture should also indicate one of the following majors:

- Agricultural Communications
- Agricultural Economics
- Agricultural Mechanization
- Agronomy
- Animal Science
- Dairy Science
- General Agriculture
- Horticulture
- Vocational Agriculture

COLLEGE OF COMMERCE AND BUSINESS ADMINISTRATION. CURRICULA:

Commercial Teaching Major (all students desiring this curriculum)

General (all students entering with less than 45 semester hours except those desiring commercial teaching)

Transfer Students entering with 45 or more semester hours should indicate one of the following majors on the application:

- Accountancy
- Combined Majors
- Commerce and Law
- Economics of Government
- Business, Publication and Transportation
- Economic Theory
- Finance
- General Economics
- Industrial Administration
- Insurance
- Labor Economics
- Management
- Marketing
- Personnel Management
- Secretarial Training
- Statistical Economics
- Urban Land Economics

COLLEGE OF EDUCATION. CURRICULA:

- Elementary Education
- Industrial Education
- Teacher Education — Deaf and Hard of Hearing[1]
- Teacher Education — Mentally Handicapped[1]
- General (Requires Junior standing. Also indicate field of specialization.)

[1] Has special admission requirements.

COLLEGE OF ENGINEERING. CURRICULA:

- Aeronautical and Astronautical Engineering
- Agricultural Engineering
- Ceramic Engineering
- Civil Engineering
- Electrical Engineering
- Engineering — Liberal Arts and Sciences (5-Year Program)
- Engineering Mechanics
- Engineering Physics
- General Engineering
- Industrial Engineering
- Mechanical Engineering
- Metallurgical Engineering
- Mining Engineering

COLLEGE OF FINE AND APPLIED ARTS. CURRICULA:

- Architecture
- Art — General (All freshmen and all transfer students with less than 30 semester hours indicate *General Curriculum.* Others indicate one of the following):
  - Advertising Design
  - Art Education
  - Crafts
  - History of Art
  - Industrial Design
  - Painting
  - Sculpture
- City Planning
- Landscape Architecture
- Landscape Operation
- Music — Instrumental, Music Composition, Music History, or Vocal Music
- Music Education — General, Choral, or Instrumental

INSTITUTE OF AVIATION. TWO-YEAR TERMINAL CURRICULA:

- Aircraft Maintenance
- Aviation Electronics
- Professional Pilot Training

COLLEGE OF LIBERAL ARTS AND SCIENCES. CURRICULA:

- Chemistry
- Chemical Engineering
- Division of General Studies
- Home Economics
- Occupational Therapy[1, 3]
- Physics[3]
- Pre-Dentistry[3]
- Pre-Journalism
- Pre-Law
- Pre-Medicine[3]
- Pre-Pharmacy
- Pre-Professional Nursing[3]
- Pre-Veterinary Medicine[3]
- Sciences and Letters[3]
- Speech Correction
- Teacher Education[4]

[1] There are special entrance requirements for this curriculum.

[3] Requires high school rank in the upper 50%.

[3] The usual program of two years of basic work followed by a major and minor. Transfer students with 56 or more semester hours (exclusive of Military or Physical Education) must also indicate a major selected from the list of approved majors under the discussion of the general curriculum of the College of Liberal Arts and Sciences in the Undergraduate Study Bulletin.

[4] Indicate Teacher Education and major teaching subject (Biology, Chemistry, English, French, etc.). (See Undergraduate Bulletin for subjects offered.)

COLLEGE OF PHYSICAL EDUCATION. CURRICULA:

- Dance (Women)
- Health Education (Men and Women)
- Physical Education (Men)
- Physical Education (Women)
- Recreation (Men and Women)

COLLEGE OF JOURNALISM AND COMMUNICATIONS. (Requires junior standing for admission.) **CURRICULA:**

- News — Editorial
- Advertising
- Radio-Television

COLLEGE OF LAW. (Three-year curriculum requires senior standing for admission.) **CURRICULUM:** Indicate only Law on the application blank.

COLLEGE OF VETERINARY MEDICINE. Professional training in veterinary medicine and surgery. (Requires junior standing for admission, including prescribed subjects.) NOTE: A special application blank is required which may be obtained from the Office of Admissions and Records.

FICE USE ONLY

I.D. Number

Name (1)

Sequence Number

te (2) | County (2)

ign | New (4) | Sex (5)

t. (7) | Mar. (6)

(8) | Day | Yr.

— Sal. | Percentile Rank

l. Def. | P.E. Def.

est Q | Adm. St.

urs Earned | Class

High School Code

Junior College (21)

oreign Status

FOR OFFICE USE ONLY

UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

UNDERGRADUATE APPLICATION FOR ADMISSION

This blank must be typed or filled out in INK. PRINT ALL ENTRIES LEGIBLY. Mail to Office of Admissions and Records, University of Illinois, Urbana, Illinois 61803. Have *all* collegiate institutions previously attended send transcripts of credits to the above address.

Date_____

1. Full LEGAL name Mr. / Mrs. / Miss _____ (Last Name / First Name / Middle Name (Maiden name if married))

2. Permanent home address _____ (Street and Number / City or Town / Zone)
_____ (County) _____ (State or Country)

3. Mailing address _____ (Street and Number) _____ (Telephone Number)
_____ (City or Town / Zone / State or Country)

4. Have you previously attended or are you now attending the University of Illinois? ☐ Yes ☐ No
Have you attended or are you now attending any other collegiate institution? ☐ Yes ☐ No

5. Sex: ☐ Male; ☐ Female 6. Marital Status: ☐ Single; ☐ Married
If married, give name and address of spouse _____ (Last Name / First Name / Middle Initial)
Address _____ (Street and Number / City or Town / State or Country)
Is spouse: { a student ☐; a staff member ☐; former student ☐; former staff member ☐; applicant for admission ☐; } at U. of Ill.?

7. Have you served on active duty with the armed forces? ☐ Yes; ☐ No
If yes: Branch _____ Dates of Duty: Entry _____ Separation _____

8. Date of birth _____ (Month / Day / Year) 9. Place of birth _____ (City or Town / State or Country)

10. Are you an American citizen? ☐ Yes; ☐ No
(a) If answer is yes, indicate how you attained citizenship: ☐ Born in U.S.; ☐ Born of American parents outside U.S.; ☐ By your own naturalization; ☐ By naturalization of parent.
(If not born in United States, official evidence of citizenship must be presented with this application.)
(b) If you are not a U.S. citizen, indicate country of citizenship _____ (Country)
Are you a permanent resident immigrant in the U.S.? ☐ Yes ☐ No. If yes, give alien registration number and date admitted to the U.S. _____ (Number) _____ (Month / Day / Year)
Are you a refugee, displaced person, or parolee? ☐ Yes ☐ No. If you are an immigrant, refugee, displaced person or parolee, is it presently your intention to remain in the U.S. permanently? ☐ Yes ☐ No.

11. Do you have any form of permanent physical handicap? ☐ Yes; ☐ No
Describe briefly _____

12. Father's name in full _____ (Last Name / First Name / Middle Name) ☐ Living ☐ Deceased
13. If father is living what is his address _____ (Street and Number / City or Town / Zone)
_____ (County) _____ (State or Country)

14. Mother's name in full _____ (Last Name / First Name / Middle Name) ☐ Living ☐ Deceased
15. If mother is living what is her address _____ (Street and Number / City or Town / Zone)
_____ (County) _____ (State or Country)

16. Do you have a COURT APPOINTED LEGAL GUARDIAN? ☐ Yes ☐ No

17. When do you plan to enter the University at Urbana? Year: 19__-__ ☐ Fall ☐ Spring ☐ Summer — 8 Weeks

18. In which college and curriculum of the University do you wish to enroll? (See attached curricula list, page 2)
College _____ Curriculum _____

(Also complete page 4)

R OFFICE USE ONLY

Coll. (25) Curric.

Non-Res.

by — Date

d by — Date

d by — Date

d by — Date

DIGITAL COMPUTER LABORATORY
UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

R SIDENT

N-RESIDENT

19. High schools or preparatory schools you have attended:

Name of School	City and State	Date of Graduation Month and Year	Dates of Attendance Month and Year From	To

20. If you have attended the University of Illinois, indicate below:

	DATES OF ATTENDANCE MONTH AND YEAR From	To
☐ Urbana		
☐ Chicago Undergraduate Division		
☐ Medical Center in Chicago		
☐ Extramural		
☐ Correspondence Division		
☐ Other (Specify)		

21. List all collegiate institutions you have attended, or are now attending, other than the University of Illinois. Have each institution attended send a transcript of your record directly to the Office of Admissions and Records, University of Illinois, Urbana, Illinois 61803. If you have attended no school, write "NONE."

Name of School	City and State	Degrees, if any	Dates of Attendance Month and Year From	To

22. List in order ALL EMPLOYMENT and/or OTHER ACTIVITIES since high school graduation. Account for all time not included in items 7, 20, and 21 above.

Month and Year From	To	Employer and/or Activity	City	State

(Use additional space on inside page if necessary)

CERTIFICATE

23. I understand that withholding information requested on this application or giving false information may make me ineligible for admission to the University or subject to dismissal. With this in mind, I certify that the above statements are correct and complete.

SIGNATURE_____
(Do not Print)

Applicant Must Not Write Below This Line

24. PETITION ACTION

Dean's Signature

25. Permit to enter College of_____ Curriculum_____

Date Issued_____ By_____

☐ First Semester_____
for ☐ Second Semester_____
☐ Summer Session_____

CONTINUE ITEM 22 HERE

Month and Year From	To	Employer and/or Activity	City	State

ATTACHMENT III

List of Participants 1964

David A. Browne*	Cornell University
Stephen J. Czuchlewski	Manhattan College
Carl D. Farrell	Florida State University
Margaret J. Harrison	Mercyhurst College
William C. Mitchell	Miami University
Peter T. Rolland	University of Illinois (Urbana)
Rena R. Schwartz	McGill University (Montreal)
Leon Shen	Purdue University

* Unable to complete full session.

ATTACHMENT IV

MACHINE PROBLEMS

Machine Problem No. 1

Prepare a SCATRE program which computes and prints the integer values of the polynomial

$$P = x^2 + 41\,x + 41$$

for values of x which run from 0 to 40 in steps of 1.

For output, use the sequence of orders

```
CALL        .PRINT
STR         FØRMAT
STR         X
STR         P
STR
```

and the format card

```
FØRMAT BCI *, 2I20*
```

Machine Problem No. 2

The Fibonacci Numbers

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, ...

are defined by the relations

$$A_0 = 0$$

$$A_1 = 1$$

$$A_{n+1} = A_n + A_{n-1}$$

Write a SCATRE program to compute and print the first fifty Fibonacci numbers. Any suitable output format may be used; a simple format may be used by punching a card with

FØRMAT	in columns 1-6
BCI	in columns 8-10
1,I20*	in columns 16-21

Machine Problem No. 3

You are to prepare a SCATRE program which computes and prints a table of odd prime numbers less than 1000. Any format for printing that you may decide on is permissible.

The simplest method for determining whether a number is prime is to divide it by a sequence of other numbers; so long as a nonzero remainder is obtained, the number may be a prime.

Two simple techniques might be used:

1) divide an odd number N by all odd numbers M such that $M^2 \leq N$; if a zero remainder is found, N is not prime.

2) As primes are generated, they are added to a list; then when an odd number N is tested, it is divided by all the primes P in the list which satisfy $P^2 \leq N$; a zero remainder means that N is not prime.

The latter technique requires somewhat more programming, since address modification must be used.

Machine Problem No. 4

An approximation to $\log_{10}(x)$ may be written

$$\text{aplog}\ (x) = c_1 y + c_3 y^2 + c_5 y^5 + c_7 y^7$$

where

$$y = \frac{x-1}{x+1}$$

and

$$c_1 = .\ 86855434$$

$$c_3 = .\ 29115068$$

$$c_5 = .\ 15361371$$

$$c_7 = .\ 21139497,$$

for values of x in the range

$$\frac{1}{\sqrt{10}} \leq x \leq \sqrt{10}$$

You are to prepare a SCATRE program which includes an internal subroutine to compute aplog (x). Your program should print out a table of values of

x
aplog (x)
1/2 aplog (x^2)
1/2 aplog (x^2) - aplog (x)
aplog (2x) - aplog 2
aplog (2x) - aplog 2 - aplog (x)

for x = .05 (.05) 2.50.

The table should consist of six columns and appropriate headings for each. A good format for printing is F5.2 for x and F15.8 for the others.

Machine Problem No. 5

The data for this problem consist of a deck of cards on each of which is punched the rectilinear coordinates (x_i, y_i, z_i) of a point P_i in three-dimensional space. The punching of each card is as follows:

columns	1-10	contain	i, the index of P_i
	11-25		x_i
	26-40		y_i
	41-55		z_i

You are to prepare a SCATRE program which reads the data (the total number of points N is ≤ 999) and prints the following information:

1) the total number of points,
2) the point at furthest distance from the origin,
3) the pair of points at maximum distance from each other,
4) the pair of points at minimum distance from each other.

You should also print out the values of the distances computed in 2), 3), and 4).

No distance is greater than 1000.

Machine Problem No. 6

You are to prepare a SCATRE subroutine which will find the greatest integer less than or equal to the square root of a given integer N. The subroutine must be able to distinguish between FØRTRAN integers (which are stored in the decrement portion of a word) and SCATRE integers (which may occupy a full word), and must return the answer in the AC in the form appropriate to the program which called it.

You may devise any usable scheme for determining an initial approximation to the desired square root.

You should also prepare a driver program which will provide your subroutine with test values of N, and print out the results.

Machine Problem No. 7

You will be given a data deck consisting of one card with two integers P and Q, and a number of cards which contain four floating point numbers each. The first card may be read with a 2I10 format, and the succeeding ones with a 4F15.0 format. The data on the cards after the first are y_0, y_1, y_2, y_3; those on the following card y_4, y_5, y_6, and y_7 and so forth. There will be P values of y in all.

Prepare a SCATRE program which will read this data and compute the following quantities:

$$a_o = \frac{2}{P} \sum_{j=0}^{P-1} y_i$$

$$a_n = \frac{2}{P} \sum_{j=0}^{P-1} y_i \cos \frac{2\pi nj}{P} \qquad n = 1, 2, \ldots, Q$$

$$b_n = \frac{2}{P} \sum_{j=0}^{P-1} y_i \sin \frac{2\pi nj}{P} \qquad n = 1, 2, \ldots, Q$$

The output should appear as follows:

A(0) = 13.278

A(1) = -2.943 B(1) = 11.483

. .
. .
. .

A(Q) = .013 B(Q) = 3.014

(These values are not the correct answers.)

Machine Problem No. 8

You are to prepare a SCATRE program which will find the ten smallest roots of the function

$$f(x) = \frac{e^{-2x}\cos(\pi x^2/8)}{(3|\log x| + 17)}$$

using (1) the method of binary chopping
(2) the method of false position (regula falsi),
(3) the Newton-Raphson method

In each case, find the root to within 10^{-6} of its true value, and print out the value of the root and the number of iterations required to find the root.

Machine Problem No. 9

The Fibonacci Numbers

$$0, 1, 1, 2, 3, 5, 8, 13, \ldots$$

are defined by the recurrence relations

$$A_0 = 0$$

$$A_1 = 1$$

$$A_{n+1} = A_n + A_{n-1}$$

You are to prepare two SCATRE programs using MACRO instructions which will print out a table of the first fifty Fibonacci numbers. Your programs should include at least three MACRO instructions, as follows:

MACRO Name	Function of MACRO
FIB	generates terms of the sequence
ØUT	prints the terms
TEST	performs counting and tests

The first program should use no created symbols; the second may use created symbols wherever they are convenient.

Machine Problem No. 10

You are to prepare a SCATRE program which will solve an $N \times N$ set of linear equations. The data deck provided contains on the first card (somewhere in the first 72 columns) the number N of equations. The remaining cards contain the $N^2 + N$ elements of the augmented matrix to be solved, in column order (i.e., in the order a_{11}, a_{21}, a_{31}, $\cdots$ a_{N1}, a_{12}, a_{22}, $\cdots$ a_{N2}, etc.), which may be read with a 5F15.4 format.

You may use Gauss-Jordan elimination with no search for pivots (i.e., taking as pivot elements a_{11}, a_{22}, ... a_{NN}) in which case row interchanges may be required; or you may use Gauss-Jordan elimination with a partial pivoting strategy, as follows:

a) Scan the pivot column (take them in the order 1,2, ... N) for the element of largest absolute value, which does not lie in a row which has already been used as a pivot row. (If this element is zero, the matrix is singular.)

b) Divide the pivot row by the pivot element, and make an indication that this row has been used.

c) Reduce all the rows of the matrix (except the pivot row, of course) using the formula

$$a_{ij} = a_{ij} - a_{ik}\, a_{mj}$$

where i and j are the row and column being reduced, and m and k are the pivot row and column, respectively.

d) Print out the answers (which are found in $a_{i,N+1}$) in the form X(i) = -----.

Machine Problem No. 11

The Tchebyshev polynomials $T_n(X)$ may be defined by the recurrence relations

$$T_o(X) = 1,$$

$$T_i(X) = X,$$

$$T_{n+1}(X) = 2XT_n(X) - T_{n-1}(X) \quad (n > 0)$$

Prepare a FØRTRAN program which prints a table of values of the Tchebyshev polynomials T_2, T_3, ..., T_9 for values of X = -1(.05)1. Your printout should contain appropriate headings.

ATTACHMENT V

SEMINARS CONDUCTED BY N. T. HAMILTON

My main contribution to this program consisted in lecturing to the group daily on a variety of topics centering mainly around numerical analysis. The topics included

1) A fairly extensive discussion of orthogonal polynomials and Gauss integration. This followed more or less the lines of Chapter II of Wilf's Mathematics for Physical Scientists.

2) Other integration schemes, such as Newton, Cotes, and Romberg, with error discussions for each.

3) Chebysheff Approximation, and the Weierstress Approximation Theorem via Burnstein Polynomials.

4) Integration of ordinary differential equations, with examples of stable and unstable methods. Brief discussion of Runge-Kutta methods.

The group was of course very bright so that the above topics were treated with a fair amount of mathematical honesty, theorems were proved, and ideas seemed to go over.

In addition to the above more or less systematic lectures there were several lectures on assorted topics:

I proved the Bertrand Postulate about prime numbers in one; I gave several talks about the solution of combinatorial problems using generating functions in another (this led to the Lagrange inversion formula); and on the last two days I talked about automated theorem proving. Although I thought this last topic was pretty ambitious for the time that was available, several of the students kept asking intelligent questions.

ATTACHMENT VI

SEMINARS CONDUCTED BY T. A. MURRELL

The logical design part of the summer session was covered by a series of lectures held initially five times a week (starting on June 17) and reduced in mid-July to a three-day sequence. At that time, in response to interest expressed by approximately half the student group, optional lectures were given on Tuesday and Thursday covering a brief treatment of semiconductor physics, junction diodes, and transistors.

No text was used, but references were made to the following books and articles:

F. E. Hohn, Applied Boolean Algebra. Macmillan, 1960.

W. S. Humphrey, Switching Circuits. McGraw-Hill, 1958.

N. R. Scott, Analog and Digital Computer Technology. McGraw-Hill, 1960.

R. B. Hurley, Transistor Logic Circuits. John Wiley, 1961.

M. Phister, Logical Design of Digital Computers. John Wiley, 1958.

J. E. Robertson, "Introduction to Digital Computer Arithmetic." File No. 599, Digital Computer Laboratory, University of Illinois, Urbana, Illinois, June 5, 1964.

J. E. Robertson, "Redundant Number Systems for Digital Computer Arithmetic." File No. 284, Digital Computer Laboratory, University of Illinois, Urbana, Illinois, 1958.

IBM Systems, IBM 7094 Principles of Operation. Reference Library, Rev. August, 1963.

Outline of Topics

Boolean Algebra; basic properties; postulates; a few theorems

Venn diagram; relation to theory of sets; use of Venn diagrams to demonstrate theorems

Propositional logic; logical connectives

The exclusive OR; cancellation theorem; the Sheffer stroke; the double stroke

Application of Boolean algebra to relay logic
Circuit logic as used in a digital computer
Design of a binary-to-decimal decoder
Combined relay logic and circuit logic; the 2-out-of-8 code (telephone dataset)
Formal reduction schemes; the Quine-McCluskey method; the Karnaugh map
Don't care conditions; simultaneous functions
Logical design of half adder; the full adder; the subtractor
Diode logic; emitter logic; collector logic
ILLIAC I scheme for full adder, subtractor
Gating and shifting; single register vs double register
Counters
Coding schemes; signed magnitude, radix complement, diminished radix complement
Logical design of sequencing circuits
Flipflop; complementing flipflop; the C element; the F element
IBM 7094 adder logic
Subtraction using 1's complements; overflow
Subtraction using 2's complements
Multiplication; signed magnitude; organization of 7090 and 7094
Multiplication using 1's complements and 2's complements
Control sequencing for 7094 multiplier
Restoring and nonrestoring division
Recoding schemes; the Gray code
Redundant codes
Minimization codes
Separate carry storage

Homework Assignments

During the first three weeks, four problem sets were assigned to be turned in, corrected and returned. (Copies are attached below.) During the remainder of the summer session, problems were suggested from time to time and made the topic of a class discussion at a subsequent meeting.

Conclusions

Progress from the first fundamentals of Boolean algebra to discussions of computer organization was made with encouraging speed and apparent ease on the part of the students. In this respect, the group compared favorably with a similar group at the 1963 summer session. The keen interest in the more sophisticated problem of redundant arithmetic and optimal recoding was surprising. On the other hand, the interest in semiconductor devices and level of understanding attained did not match the accomplishments of a few of the 1963 students.

Problem Set No. 1

Work out formal proofs, and use Venn diagrams only for illustration and confirmation.

1. Prove that if

$$A \leq C \text{ and } B \leq C, \text{ then } A \vee B \leq C \text{ and } AB \leq C$$

and if

$$A \geq C \text{ and } B \geq C, \text{ then } A \vee B \geq C \text{ and } AB \geq C$$

2. Prove that

$$AB = 0 \text{ if and only if } A \leq \overline{B}$$

3. Prove that

$$A \geq B \geq C \text{ implies } A\overline{B} \vee B\overline{C} = A\overline{C}$$

4. Prove that

$$A(BC) = (AB)\overline{AC}$$

5. Reduce:

$$A\overline{B} \vee A\overline{B}C \vee A\overline{B}(D \vee E)$$

Problem Set No. 2

Test for validity with Venn diagrams:

1. Some reformers are fanatics
   All reformers are idealists
   Therefore, some idealists are fanatics

2. No tragic actors are happy men
   Some comedians are not happy men
   Therefore, some comedians are not tragic actors

3. Some neurotics are not parasites
   All criminals are parasites
   Therefore, some neurotics are not criminals

4. All underwater craft are submarines
   No pleasure vessels are underwater craft
   Therefore, no submarines are pleasure vessels

5. Some snakes are not dangerous animals
   All snakes are reptiles
   Therefore, some dangerous animals are not reptiles

Problem Set No. 3

Minimize and show the transmission logic circuit for the truth tables:

1.

x	y	z	f_1
0	0	1	1
0	1	1	1
1	0	1	1

f_1 = 0 otherwise

2.

x	y	z	g
1	0	0	0
1	0	1	0
0	0	1	0

g = 1 otherwise

3.

w	x	y	z	f_2
1	1	0	0	1
0	1	1	0	1
0	1	0	0	1

f_2 = 0 otherwise

Problem Set No. 4

Simplify, using the Quine-McCloskey method

$$f = AB \vee A\bar{B}C\bar{D} \vee A\bar{B}\bar{C}D \vee \bar{A}BCD \vee \bar{A}B\bar{C}\bar{D}$$

ATTACHMENT VII

LETTERS FROM PARTICIPANTS IN THE
NATIONAL SCIENCE FOUNDATION SUMMER PROGRAM

C
O
P
Y

Urbana, Illinois
August 11, 1964

Dr. John R. Ehrman
Digital Computer Laboratory
University of Illinois
Urbana, Illinois

Dear Dr. Ehrman:

This summer was a most profitable and enjoyable one for me. I have learned much and I expect to continue working in this field. In the remaining weeks before school, I will finish studying the manuals so that I may qualify as a programmer for, perhaps, the Physics Department at the University of Illinois. I am also interested in the simulation of creative activity on computers, and I hope to put the experience I gained this summer to use in that field.

I have two suggestions to make concerning the format of this NSF summer program. First, I would have appreciated knowing a bit more in the beginning of the summer what was expected of me; in fact, I would have appreciated it if more had been expected of me, for I would have learned more, I am sure. I also think it would have been profitable to have learned how to operate the 7094 console and the 1401's. I know that in past summers students were required to operate the ILLIAC by themselves, and hence, had to know how to use the console and the 1401's. Couldn't something similar be worked out for students using the 7094? Even if the students have no opportunity to run their own programs, they would at least know how to run them.

The lectures given this summer were very useful; in particular, I wish to thank Professor Hamilton for his most interesting lectures. My thanks for all your help this summer.

Yours truly,

Peter Rolland /s/

Peter Rolland

C
O
P
Y

August 29, 1964

Dr. John R. Ehrman
Digital Computer Laboratory
University of Illinois
Urbana, Illinois

Dear Dr. Ehrman:

I want to take this opportunity to thank the National Science Foundation and the University of Illinois for making this summer's experience possible. Many thanks also to you, Professor Hamilton and Professor Murrell for not only being concerned with our education in the field of computers but also us as people.

Although I am an electrical engineering major who has had an interest in computers I found that until this summer the digital computer has been only a group of "black boxes" with little meaningful interconnection. I feel that now I have a little insight into the operation of a computer and the mathematics and programming techniques which are used to obtain significant and meaningful results.

I feel that this summer has been a very worthwhile educational experience for myself. Programming, for example, is very difficult to learn on one's own for it is very meaningless to read a manual without trying actual problems. However, when it is taught as it was to us this summer, with problems to run that had interest to us beyond just programming practice, we really absorbed it. It is really impossible to learn proficient programming without having informal gatherings like we did this summer. I found that in working with Mr. Akemann's CRUNCH subroutine that I have a "feel" for programming subroutine calling sequences and the useful transfer of parameters that I just could not have gotten otherwise. I feel that in this area I can do more than just mechanical coding of instructions but instead write a sequence of instructions that to some sense are optimized.

Before this summer I found it easy to learn something about the electrical design of some of the building blocks in a computer but it took the guidance that was available this summer to teach me how to combine these blocks in a more efficient manner. Compared with what I learned in this area this summer all my previous experience is only a thin film in a deep ocean. Similarly the field of numerical analysis needs much patient guidance from a good teacher.

I think that the type of guidance we had this summer was ideal; we were not told to do certain things from a rigidly fixed set of topics but instead asked what we wanted to spend our time learning. We were very fortunate indeed to have local experts who were willing to spend their time to come in and lecture and demonstrate or illustrate various specialized fields of computer hardware or programming software. These people were ones who are really interested in computers and also interested in teaching some of their knowledge to students and to me means a lot.

I agree very definitely with the general structure of the summer program and differ with it only on some very minor details. The only changes which I would like to see are the following:

1) Send all participants as early as possible a copy of the University of Illinois Math 195 lecture notes, 7094 Manual, and the PORTHOS operating manual so that they can get some of the preliminaries out of the way.

2) Send a list of suggested reading so that all of the participants will be ready to start as soon as the program starts.

3) If possible extend the program by two weeks so that more can be done.

4) Teach ILLIAC II programming along with IBM 7094 programming so that it is not of secondary importance. Perhaps with the ILLIAC II, since it is not utilized full time as is the 7094, students can get some feel of operating a computer by running the console for their own problems at some late hour with supervision from one of the professors.

5) Make the program known to and open to qualified underclassmen.

6) Start lectures on specialized hardware by local experts earlier with more of them.

7) Start earlier with disc and possibly include tape I/O so that we can get a feel for writing our own instead of using EC routines so that in case we ever have to use an installation without the EC routines we need we will not be lost.

8) If possible move the housing to a closer place to the keypunch and computer library.

Again I want to thank everyone involved in making this program possible and to offer my services to help such a worthwhile program in any way possible.

Very sincerely yours,

Leon Shen /s/

Leon Shen

C
O
P
Y

Baker Street Extension
Jamestown, New York
September 9, 1964

Professor Ehrman
University of Illinois
Digital Computer Laboratory
Urbana, Illinois

Dear Professor Ehrman:

Participating in the N S F Digital Computing Program at the University of Illinois this past summer was truly a rewarding and profitable experience for me.

The material presented in the classes and seminars has certainly given me a good foundation in all aspects of computing; I hope that the general outline of this year's program will be continued. I think it would be helpful if the Math 195 notes were sent to the participants after they had accepted, in order that they might be familiar with the 7094 and SCATRE, and so much time need not be spent on introductory programming. This time could then be spent in teaching MAD and the other programming languages more thoroughly.

I do have one regret--that I didn't concentrate on doing one main project over the summer. At the end of the first two weeks, and after one group discussion concerning projects, each participant should have a scheduled meeting with one of the three professors, and together they could decide on the scope of the project. I think this meeting is most important. Classes should gradually be cut down in number before the seventh week--maybe after the fourth week so that students may concentrate on their projects.

Concerning room and board, I think that the participants should be sent more information concerning single and double room reservations, meal passes, and the rates for such.

I would like to thank Professor Murrell, Professor Hamilton, and you, Professor Ehrman, for making this such a worthwhile and enjoyable summer.

Sincerely,

Margaret Harrison /s/

Margaret Harrison

C
O
P
Y

23 West Spring Street
Oxford, Ohio
September 17, 1964

Dr. John Ehrman
Digital Computer Laboratory
University of Illinois
Urbana, Illinois

Dear Dr. Ehrman:

I would like to take the opportunity at this late date to thank you for a very interesting summer. I can not remember a more enjoyable summer. I think everyone in the program this summer found the experience both educational and enjoyable. I hope many more students will be able to participate in the program in future summers. The program is an excellent opportunity for anyone interested in computer science.

Now that I've had ample time to reflect on the program, there is only one possible change that comes to mind. At the beginning of the summer it might be advantageous to hold a meeting to discuss aims and objectives. If each group knew what other groups had accomplished and what was expected of them, it would serve as a guide. This year's group was assailed by doubts as to what we had accomplished during the summer. I think also it would be beneficial for everyone to work on some project, preferably of his own choosing.

As for my project I think it will probably be several months before I have anything ready to submit for publication as I don't expect to have a lot of spare time at Caltech. In the past few weeks I have done a good bit of work on the theoretical aspects of the lattice-point problem, particularily on a probability model. I hope this will lead to a good approximation but I have my doubts as to whether it will give many mathematically rigorous proofs.

Also don't bother to run the program marked "Block Coord" as it is not dimensioned high enough. It was only a check on an error I detected in the published results but because I have since found another error, I am more confident of my results (and of the superiority of a 7094 to a 650).

Yours truly,

Wm. Mitchell /s/

Wm. Mitchell

C
O
P
Y

4 Benilde Hall
Manhattan College
50-50 Fieldston Road
Bronx, New York 10471
October 10, 1964

Digital Computer Laboratory
University of Illinois
Urbana, Illinois

Dear Dr. Ehrman:

I would like to thank the University of Illinois and the National Science Foundation for enabling me to participate in the NSF Digital Computing Program this past summer. It was a very worthwhile experience and should be continued.

I myself am continuing the study of computers which I began at Illinois. I am presently using a digital computer to evaluate certain functions (such as the Schrodinger Equation) that are of special significance to the physicist. The results of this investigation will constitute my Senior Thesis, which the Department of Physics at Manhattan requires for graduation. I am seriously considering furthering my study of "digital computing" in graduate school and of going on to make this my special field of interest.

Perhaps one of the most favorable features of the whole program was its complete "informality." By this I mean that each student was permitted to work at his own pace on whatever aspects of digital computing he found most interesting. Largely freed from the requirement of studying a fixed syllabus, he could thus pursue his own interests as deeply and as thoroughly as he wished. This, I feel, was essential in view of the very wide variation in the backgrounds of the participants.

In general I was quite satisfied with the program, but I do have a few suggestions on how it might be improved. The formats of Dr. Ehrman's and Dr. Murrell's courses were excellent; however, I feel the format of Dr. Hamilton's Numerical Analysis course should be somewhat modified. I think the class should meet only three times a week and that machine problems, illustrating the application of the methods studied in class, ought to be regularly suggested. It would also be helpful if a text were available for this course and if the presentation followed the text. I should add, nevertheless, that I have had occasion to study some numerical methods in preparing for my thesis and have found the background acquired from Dr. Hamilton's course to be very helpful.

I think it would be a great advantage to the participants if the Math 195 and the IBM 7094 manuals were sent to them about a month before the start of the session. I would have particularly appreciated this since I had had no previous experience with computers. Since the courses did not presume any prerequisites in computing, I did not experience any real difficulty but it would have been preferable not to go into the program "cold."

Finally, I think the faculty should prepare a wider variety of suggested projects--covering several different aspects of math and physics and of varying degrees of difficulty. They need not be completely original problems, but simply something that the student can work on throughout the last four or five weeks of the session. Again, since I had no previous background in computers, I found it impossible to suggest a project of my own and the projects which the faculty suggested seemed too ambitious for me to undertake, at least in the earlier weeks of the session. I eventually had the opportunity of cooperating with Bill Mitchell in writing a small subroutine for his "Lattice Point" project, and I found this to be educational and very satisfying experience.

These last words could appropriately sum up my opinion of the entire program. I would again like to thank all those at the university, at the Digital Computing Center and especially you, Dr. Ehrman, and Dr. Murrell and Dr. Hamilton for the friendly, personal interest which you took in each one of us.

Sincerely yours,

Steve Czuchlewski /s/

Steve Czuchlewski

C
O
P
Y

5212 King Edward Avenue
Montreal 29, Quebec, Canada
October 13, 1964

Professor John Ehrman
University of Illinois
Digital Computer Laboratory
Urbana, Illinois

Dear Professor Ehrman:

First I would like to apologize most humbly for being so late with my letter. I was quite sick with hay fever and couldn't write. Also, thank you for sending me my program of prime numbers.

The program should certainly be continued next summer. In my opinion, the most important aspect was the experience of working with brilliant students in different fields from all over the country. The effects of this contact are intangible, but it is just as valuable as what we actually learned. It gives you a terrific impetus to go on in your studies. It is a pity we were not ten--this seems to be the optimum number.

The administration of the program was very good, considering the amount of red tape required by the university (can't it be reduced?), but the students should be warned in advance about it, and in particular, told not to pay any housing fees, in order to avoid the confusion we had this year. They should be sent a map of the campus, and warned about the very hot humid weather! Those in dormitories should have phones--we often used ours to discuss problems, or to arrange for a drive down to ERL. They should also be given the choice of single or double rooms, if these are available. Finally, they should be housed nearer ERL if possible. A 20 minute walk each way often discouraged me from going down.

The advertisements sent out were excellent, but should go to more universities--for example, to more Canadian ones--and if possible, earlier (say December?). I appreciate previous experience not being taken into account, as there is something to be learned no matter what your background.

The lectures were well planned, and the three professors balanced their material, but they should have stopped earlier. I feel that the professors should have insisted on projects, and suggested a few more than they did. (I got interested much too late, and would liked to do something with number theory, especially primes.) The lectures were neither too fast nor too slow--I wasn't always up to date, but then I didn't work as hard as I should have. (I think I was unprepared for living both in a dormitory and on an American campus in summer. No one seemed to work very hard.) I especially liked the lectures on single topics, and would suggest one or two about the use of ILLIAC II, which is unique to U of I.

I am sorry, however, that we did not manage to tell Professor Hamilton right at the beginning that we were not following his lectures very well. The group discussed this during the last week of the program, when it was too late, and we agreed that it was our fault for not having had the courage to suggest some other topic that we were more interested in. He is a brilliant man, and we felt we did not treat him fairly.

These criticisms are of minor points only: In general, the course is wonderful. Keep it a noncredit course--this throws the student back on his own responsibility,* and, together with the informal way of working with the professors, the special privileges, and the advantages of meeting people with the same interests, gives him a good idea of graduate school. I loved it. I now possess a valuable tool for future work, and a better insight into maths in general, and into working on my own.

Yours truly,

(Miss) Rena Schwartz

(Miss) Rena Schwartz /s/

* (Because there are no exams.)

C
O
P
Y

P. O. Box 102
Florida State University
Tallahassee, Florida
November 13, 1964

Dr. John R. Ehrman
Digital Computer Laboratory
University of Illinois
Urbana, Illinois

Dear Dr. Ehrman:

I am sorry for taking so long in writing this letter, and I hope that it can still be included in your report. Thank you very much for the tape with the library subroutines. It got here all right, and I have already added many of them to our library, some of which are presently in use. The files from the assembly tape were perfect, but the other routines seemed a bit garbled in places. I have looked through the present library index, and there are enough routines shown in it that I did not get and would like, that I am sending another tape, and would greatly appreciate it if you could copy the entire index of subroutines onto it. This is probably easier than trying to pick most of them out individually, and there should be plenty of room on the tape.

In evaluating the program, I definitely feel that its objectives were realized, that it was very worthwhile and beneficial, and that it should certainly be continued in the future. It introduced me to facilities, uses, features, and many other aspects in the field of computing that I probably would not have had an opportunity to learn about other than in the program. Also I was given a chance to pursue and obtain help with many topics of personal interest. These and other advantages of the program helped me decide on computer work for a future occupation.

I feel that the organization of the program was very good and should remain about the same in the future. I think that the size of the group should stay at about ten, and that there should continue to be three courses taught, covering programming, design, and numerical analysis. The class times were ideal, and I think the classes should meet every day for the first three or four weeks and then cut down to two or three times a week, with special talks on other topics being given during some of the free days. I feel that it was very good that there were no grades or credits for the program. I personally, at least, was more motivated by the situation where I would learn what and how I wanted, and I felt responsible to myself for what I got out of the courses. I was very pleased with the interest and help that was given to us in each of our special interests, small or large, as they came up.

As recommendations, I feel that the program should be more widely publicized, and that it should be described in more detail regarding the subject area and level of the courses. If possible, I would also like to see a similar program established for a second summer so students could study more advanced topics and do some individual work under the supervision of experienced people in the field. I also think it would be more beneficial if participants were not held to a two program limit per run on the computer since we are only there a short time and are spending most of our time on programming. One other suggestion I would like to make concerns the projects to be done the last half of the course. Because of my previous experience, I didn't have too much trouble deciding and working on one, but many of the others seemed to feel lost and not have any ideas to work on. It would probably be better if a more definite list of possible topics could be distributed and if the professors were to help get some of the more difficult topics outlined and started for the students needing such help.

Dealing with the classes individually, let me begin with the programming class which was, to me, the best and most beneficial. I definitely feel it is desirable to teach languages for the IBM 7094 rather than for the ILLIAC since this is what we are most apt to encounter in the future. The teaching method of using many examples was very good, and the problems given as recommended homework were excellent. I would have liked to have been given a few more problems to be done in other languages that we learned (demonstrating particular assets of the language), and possibly more suggested topics, both small and large, for future work. Also I would have appreciated a more detailed description of more advanced work that is being done or that one might do in the different fields of programming. The teacher-student relationship was excellent, and the text used was quite good, but I would like to see more time spent explaining and giving examples of when each of the more complex instructions could be used to improve a program or to produce a desired result.

In the logical design class, I was very pleased with the content of the course and the teaching of it, but I would recommend a little less time spent in class drawing each kind of adder and subtractor, and working all the arithmetic of numerous examples for each. I think that after describing the different types of negative number representation and showing a few arithmetic circuits, many of the others could be left as suggested homework problems. Again I think more should have been said about the usefulness of the concepts presented, and what sort of work is being done in this field.

In the numerical analysis class I would suggest that individual theorems and topics be stated before being developed and proven, so that the students can understand what is being attempted rather than getting a lot of theory without knowing what the goals are supposed to be. Also I would hope to see more programming applications stressed, rather than simply the mathematical theory, and I think there should have been more problems given and suggested--some examples and some to be worked as homework--to be run on the computer stressing when and how to

apply the different topics discussed and showing what the main points of the course involve. More teacher-student interaction and discussion would probably have made the course much better also. I enjoyed the course quite a bit, but I don't feel that I learned as much useful information as I might have, nor do I feel that the course really achieved its goals or purpose.

Since I returned to school this fall, I have been working both as an advanced programmer and as a beginning systems analyst on our Computing Center staff. I have found all of this work very interesting, and feel that I have been greatly aided by my experience there last summer. All in all, it was a very enjoyable, educational, and successful summer for me, and I hope to follow it up in the future.

Have you found out whether I might be able to get a job there next summer with your staff as a pseudo-graduate assistant, or whatever title would be appropriate, what sort of work I might be able to do, when I could begin work (I can work from May 1 to September 1, 1965), and what pay I could receive?

Sincerely yours,

Carl D. Farrell /s/

Carl D. Farrell

BOUND BY
HNM

UNIVERSITY OF ILLINOIS-URBANA
510.84 IL6R no. C002 v.171-187(1965)
Illiac III: a processor of visual inform
3 0112 088398208